

New:  
**SMART.SWS**



**The water management system SWS.**  
Manual. By SCHELL.

## The SCHELL water management system SWS. Responsibility for health.

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The quality of drinking water in Germany is high. Up to the point of transfer (water connection), the water utilities are responsible for compliance with the quality specifications. Responsibility in the building passes to the owner, the operator and even the tenant. The task of the MEP planner and the installer is to ensure that the drinking water installation conforms to the regulations.

The relevant set of rules for ensuring drinking water quality in buildings is the Drinking Water Ordinance. It requires compliance with the recognised rules of technology in planning, execution and operation of drinking water installations. MEP planners and installers have an obligation to create the basis for safe operation – that is, that the drinking water quality can be maintained at every tapping point. The operator is responsible for ensuring that a sufficient exchange of water takes place.

Extended interruptions to operation present a challenge. The water in the pipes then stagnates. Potentially pathogenic micro-organisms find good conditions to multiply rapidly. A regular qualified exchange of water prevents this. Digitalisation creates new efficient possibilities here and additional value for modern facility management.

As experts in innovative fittings and intelligent solutions for public, semi-public and commercial sanitary facilities, we support you in the best possible way as an MEP planner, installer, or property owner/investor or manager who needs to ensure compliance with legal requirements designed to guarantee drinking water quality, as well as safe and economical building services management.

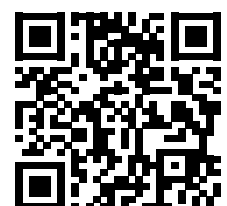
The use of digital technologies is a new element here. With SCHELL'S SWS water management system, all electronic SCHELL fittings and corresponding SCHELL products can be networked and controlled centrally and independently of a particular location – with SMART.SWS, for example. The legally required exchanges of water can thus be produced even under difficult conditions such as long interruptions in operation or very large pipelines.

With this manual we present the SCHELL water management system SWS in detail. Discover how easy planning and installation have become, how efficient and safe operation is made possible and how we can support you.

### New: Discover SMART.SWS

With SMART.SWS, the innovative addition to the SWS water management system, customers can remotely get access and analyse data online and check important status messages and evaluations on the move – no matter where you are. You have worldwide access to your buildings and always an overview.

Discover  
SMART.SWS:



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## Intelligent drinking water management.

From the experts for innovative fittings and intelligent solutions.

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SCHELL is a world-wide leader in fittings for building installation. In addition to our extensive product segments of “angle valves” and “appliance connection fittings”, we are also the supplier of fittings systems for washbasins, showers, WCs and urinals in public sanitary rooms.

We take responsibility for the health of users in this sensitive area through no-compromise product quality and outstanding technical performance. We support planners, operators and installers in carrying out their tasks safely and efficiently.

For more than 80 years, SCHELL has been continuously investing in innovative products and services, making us one of the technological leaders in our industry. We therefore offer the innovative water management system SWS and SMART.SWS in addition to advanced fittings. This enables all fittings in public sanitary rooms to be centrally

networked and controlled either by cable or wirelessly – to ensure the best possible hygiene, high water-saving efficiency and excellent facility management.

As a family-run company in its third generation, we feel committed to our Olpe business location and production site, as well as to the high “Made in Germany” standards. We are present in over 50 countries with the number increasing. We operate subsidiaries in Belgium, Poland, Hungary, India and Singapore. This enables us to meet the international demand for the innovative fittings and intelligent solutions from SCHELL.

Right: Location of SCHELL head office and subsidiaries.  
Not shown: other branch offices worldwide.



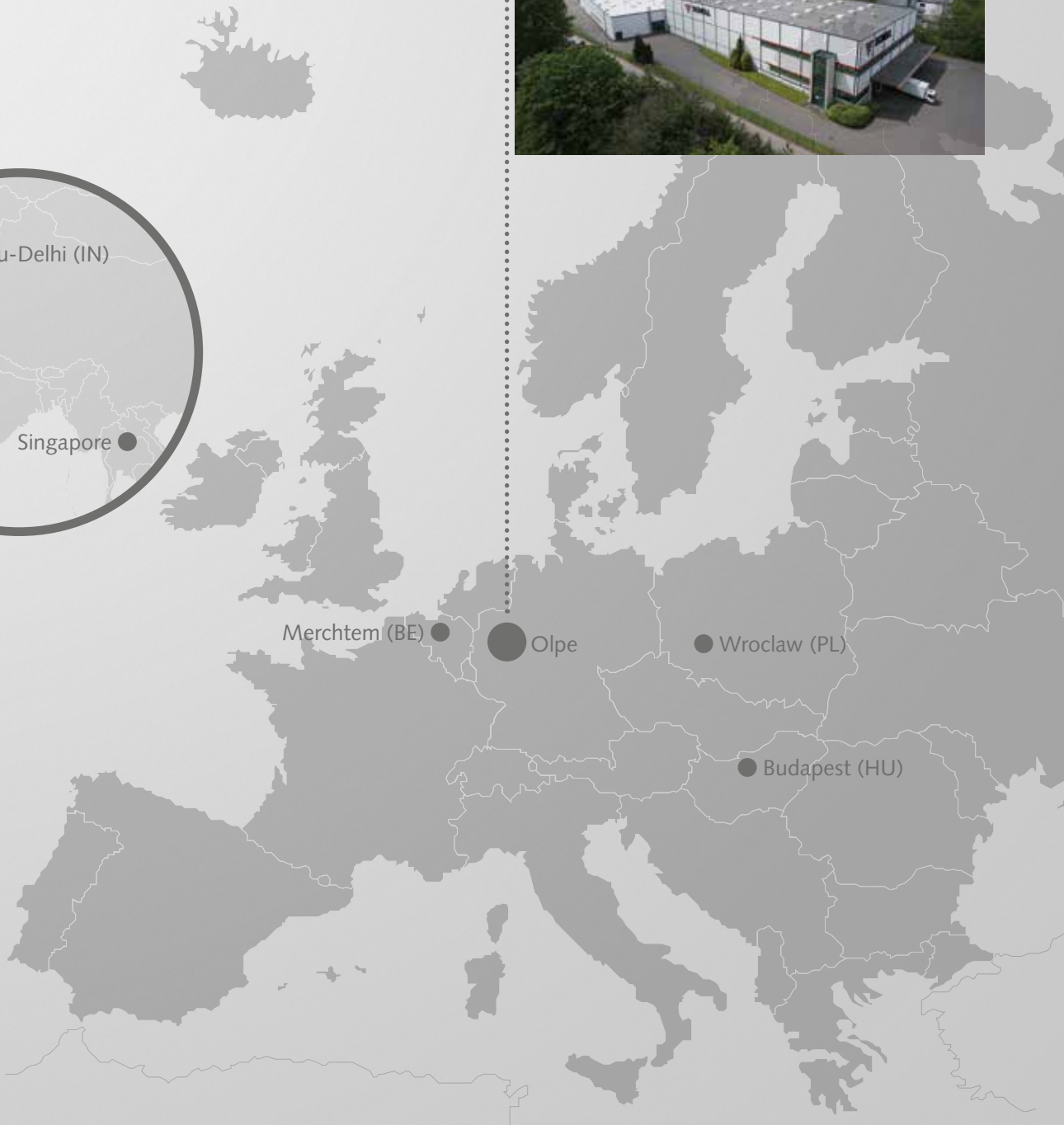
Production building with offices and training centre

Production building and logistics centre



● Neu-Delhi (IN)

● Singapore



● Merctem (BE)

● Olpe

● Wroclaw (PL)

● Budapest (HU)

## The benefits.

### For safe drinking water quality – today and tomorrow.

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The SCHELL water management system SWS networks all electronic SCHELL fittings and associated SCHELL products of a building. The fittings are programmed, controlled and monitored centrally. The drinking water installation thus meets the legal, structural and economic requirements of today. We call this “smart public”.

Particularly in public, semi-public and commercial buildings, it can be problematic to ensure the operation of the drinking water installation in such a way that the water in the entire piping system is exchanged in accordance with the requirements. Company holidays or school vacation as well as unoccupied rooms in hotels and hospitals are just a few examples that can lead to unacceptably long stagnation of drinking water in the installation. Possible negative consequences: impairment of drinking water quality and putting the users' health at risk as well as legal consequences.

VDI 6023, as the relevant set of rules, requires a complete exchange of water after three days at the latest, with hygienic proof after seven days at the latest. This must be done via sampling fittings – in case of extended interruption of operation as stagnation flush.

A drinking water installation that is as modern as it is sustainable for the future must enable the water quality to be maintained up to each tapping point.

In the context of building management, there is also the ever-increasing demand for efficient operation, often of several buildings at the same time – and: new approaches in facility management.

This is exactly what the intelligent SCHELL water management system SWS offers for networking all electronic SCHELL fittings – and even more.



#### The advantages for you as operator, MEP planner and installer:

- safe drinking water hygiene
- modern facility management
- a trend-setting drinking water installation



#### The benefits of SMART.SWS

- user-friendly monitoring of operating parameters according to VDI 6023
- mobile status data checking
- all buildings and networked fittings at-a-glance on a clearly structured dashboard
- quick adjustment of configurations – e.g. for stagnation flushes
- routine operation reports for the installation



**safe drinking water hygiene**  
 SCHELL secures and documents  
 the intended operation and thus  
 the maintenance of the high  
 drinking water quality.  
 (from p. 30)



**modern facility management**  
 central and thus efficient  
 control and monitoring of all  
 fittings as well as stagnation  
 flushes and thermal  
 disinfections  
 (from p. 50)



**drinking water installations  
 of the future**  
 safe drinking water quality,  
 even with pending or future  
 utilisation changes or  
 renovations for more  
 liberty in planning  
 (from p. 61)

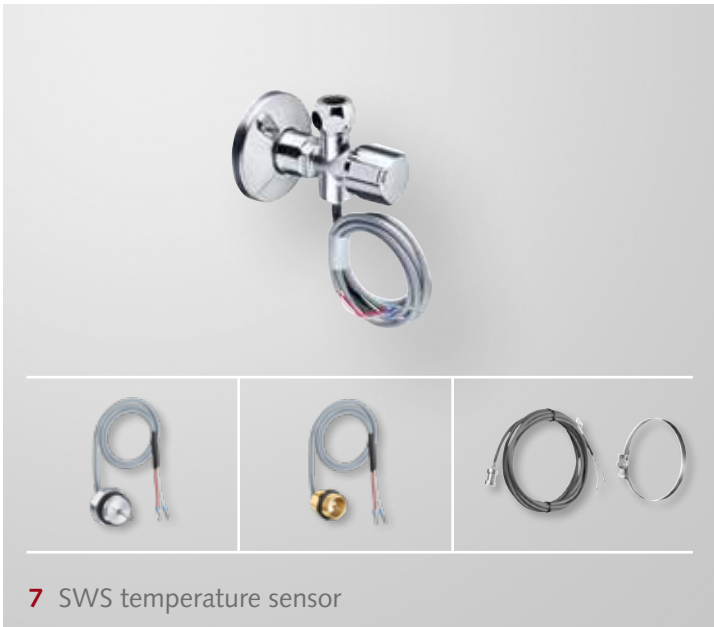
## Your “smart public” modular system. Many options – with only a few components.

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The SCHELL water management system SWS works according to the principle: few building blocks – many options. The heart of the system is the SWS water management server, through which all fittings are connected via a bus extender – either wireless or cable-based.

- 1 The **SWS water management server** with its intelligent software is the heart of the system. The server is responsible for the centralised adjustment of fitting parameters, stagnation flushes, thermal disinfection, as well as analyses and documentation. Data from up to 64 subscribers is transferred wirelessly or via a wired bus network. The SWS server can be controlled from a master facility management system. Multiple water management systems SWS can be operated in parallel.
- 2 The **SWS bus mains adapter 30V** provides power to all of the wired bus extenders and their networked fittings as well as the SWS server.
- 3 The **SWS wireless manager FM** is used to bridge longer wireless distances: it functions as a repeater and is powered by a mains adapter.
- 4 The **SWS wired bus extender BE-K** transfers data between the fitting and the SWS server along a cable up to 350 m in length (total length of all cables must not exceed 1000 m). The same cable also provides power to the BE-K and fitting.
- 5 The **SWS wireless bus extender BE-F** enables wireless data transfer between the SWS server and the electronic fitting. Power can be supplied either via the fitting's battery compartment or via a mains adapter. When supplied with mains voltage, the wireless bus extender also functions as repeater (wireless mesh network).
- 6 The **SWS gateways** enable the integration of the water management system SWS with the building automation system. A gateway translates the SWS protocol into the target standard bus protocol. Various models are available, depending on the protocols and data points that you require. One SWS gateway is required for each integrated SWS server.
- 7 The **SWS temperature sensor** records the water temperature: this data is used to control hygiene flushes and document system temperatures. To transfer the temperature data, the temperature sensors are integrated with the SWS network either by using the fitting's bus extender or by using a dedicated bus extender.
- 8 The **SWS leak protection valve** prevents water damage outside the building's hours of use while also protecting drinking water hygiene. The valve uses a programmable calendar function to shut off the water supply during times when parts of the building are not in use. The valve opens and closes automatically for stagnation flushes.
- 9 With **SMART.SWS**, the innovative add-on to the water management system SWS, users get online access to analysis data plus key status messages and reports for any building – and wherever their current location.





## SWS networks. Wired and wireless.

The structure of the SWS network is individually designed according to the requirements of the respective property. The wide range of configuration options and sophisticated technology ensure maximum flexibility.

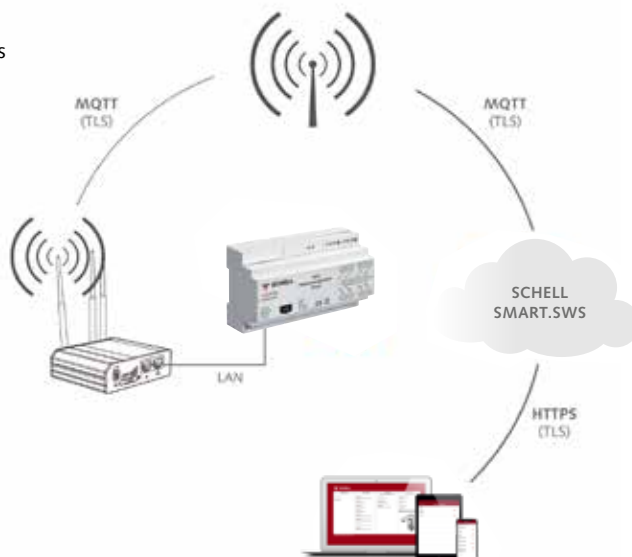
- Up to 64 subscribers can be connected to a water management server via cable or wireless.
- Cable and wireless networks can be connected in parallel.
- Access to the water management server is password-protected and possible with any network-compatible terminal device.
- Browser-based: No separate software installation is required.
- The water management system SWS can be integrated into the higher-level building automation system via a SWS gateway.

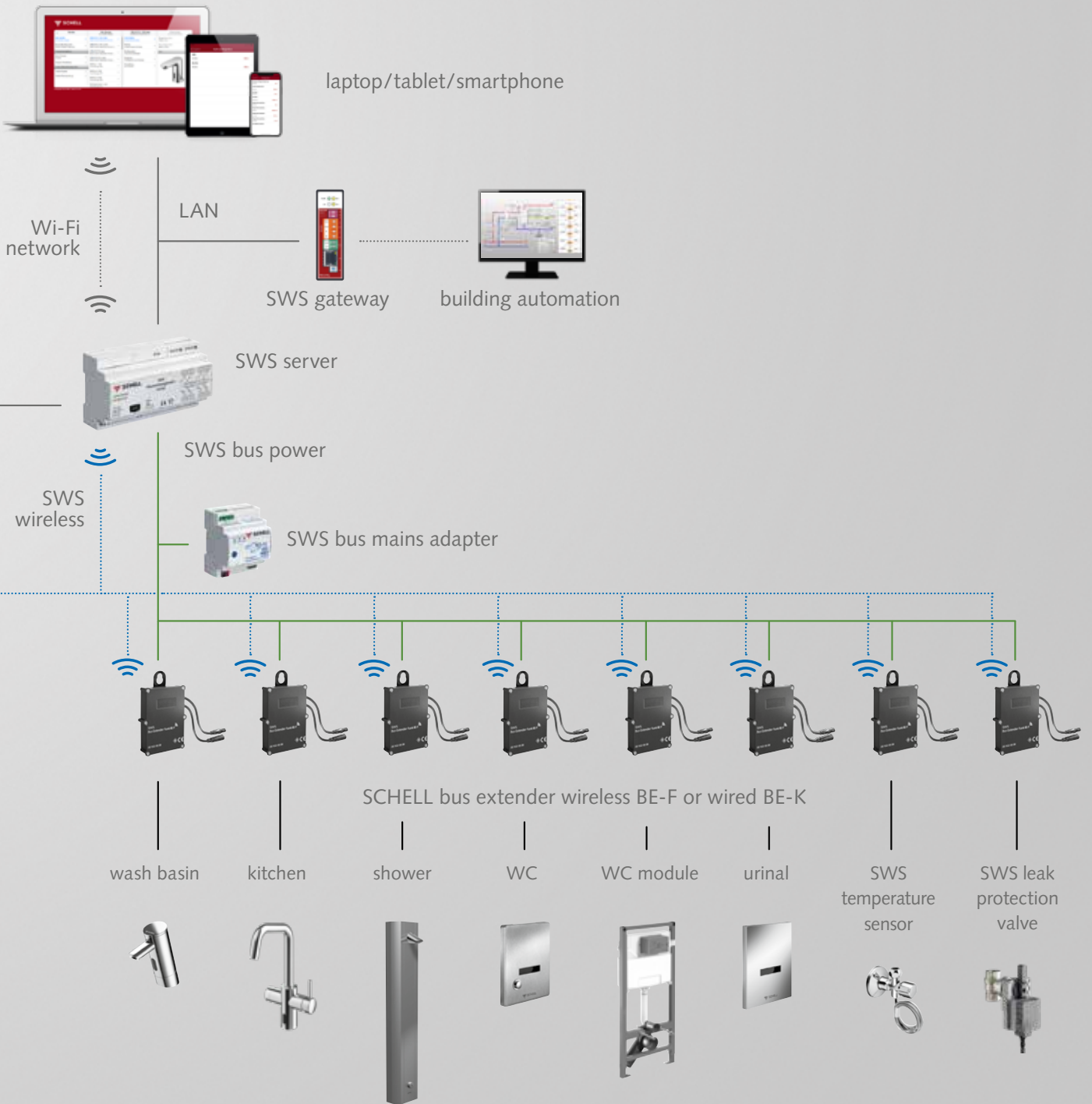
### Clever network combination

SCHELL is the first manufacturer to offer the option of combining battery operation and wireless network.



How SMART.SWS connectivity works





## SWS cable network. Custom configuration.

Cable-based networks can be individually adapted to the property free of network typologies. Since the network cable is used for both data transmission and power supply, only one cable needs to be installed.

### Network cable

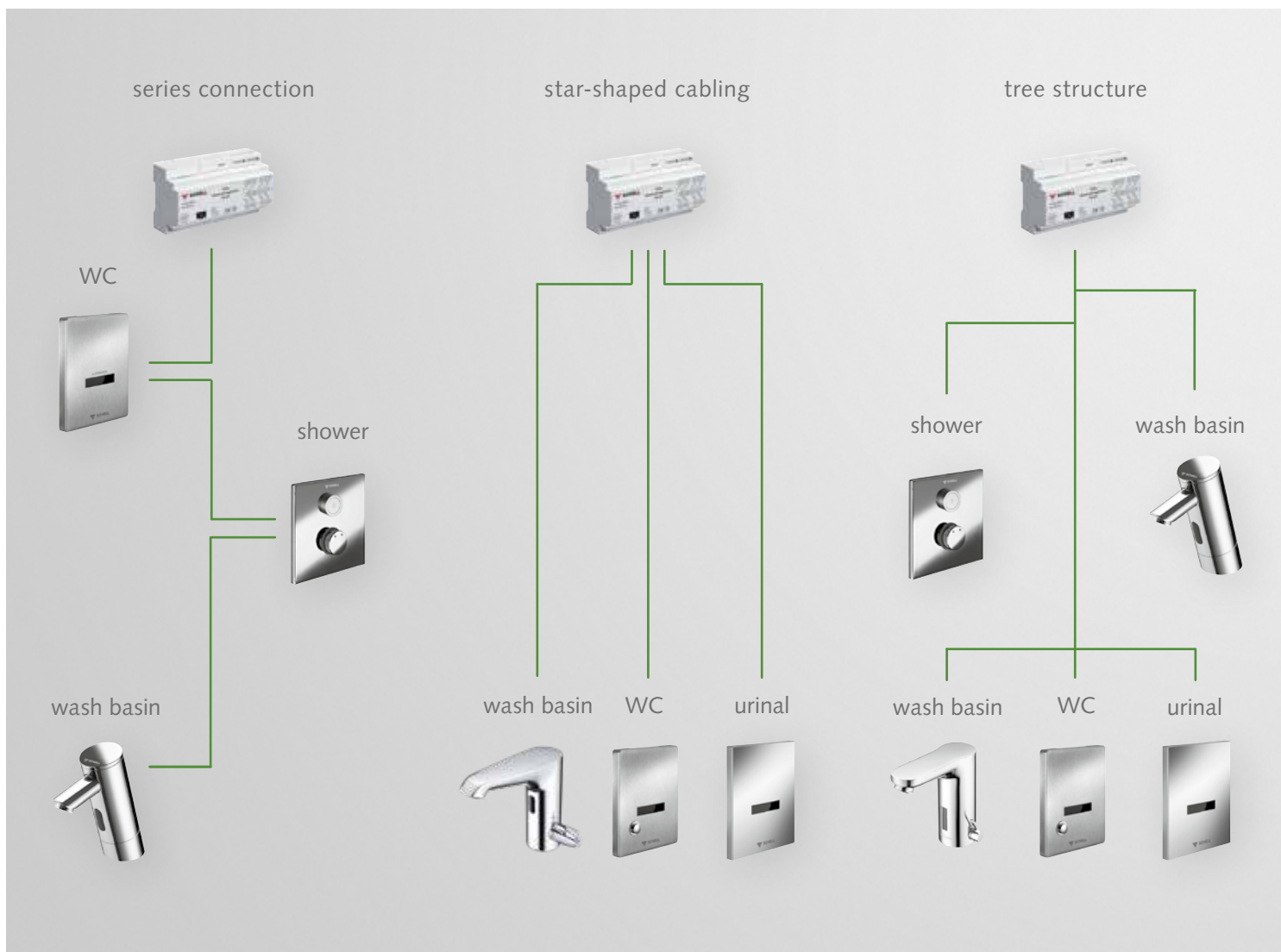
A standard network cable or KNX cable is used as network cable. The max. length of a single cable is 350 metres. The total length must not exceed 1,000 metres.

### Free network typology

Star, series, tree and mixed structures are possible. Terminal resistors are not necessary.

### Compatible cable types for the bus line:

- H(St)H 2x2x0.8
- YCYM 2x2x0.8
- J-Y(St)Y 2x2x0.8
- JH(St) 2x2x0.8



## SWS wireless network.

### Networking without chiselling work.

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The SWS wireless network allows networking without interfering with the building substance. The range is achieved by setting up a mesh network and by the optional integration of wireless managers.

#### Range

Tested outdoors: 200 metres (the range inside buildings may be affected by local factors).

#### Mains-operated subscribers form a mesh network

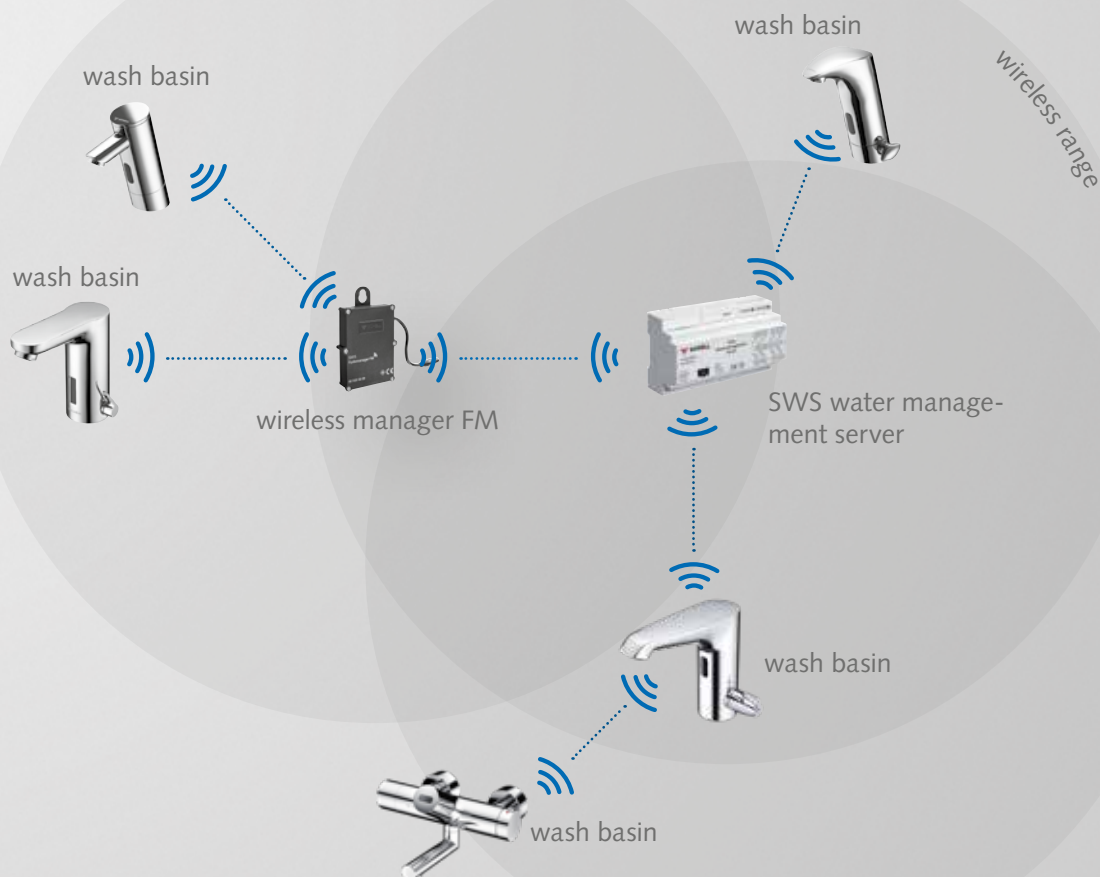
The data packets are passed on a maximum of 15 times. Wireless managers serve as repeaters. They do not constitute subscribers.

#### Supply voltage

Via battery or power adapter (110–240V) of the fitting: For 32 subscribers and more, one BE-F must be supplied with mains power or a wireless manager with power adapter must be added.

#### Data security of the wireless connection

The wireless transmission is encrypted (AES128). External ZigBee subscribers do not have access to our system.



## SWS menu: appliances.

### Configuring fittings and server centrally.

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Central access to all linked fittings makes parametrisation of the fittings and commissioning of the installation especially safe and efficient. Even easier: Fittings with the same properties can be grouped together and configured in a single operation. In the event of a change of use, the parameters of the fittings can easily be adapted to the new conditions and functions.



Open the devices menu item,  
under "All devices" ...



... and select the desired fitting  
and, for example ...

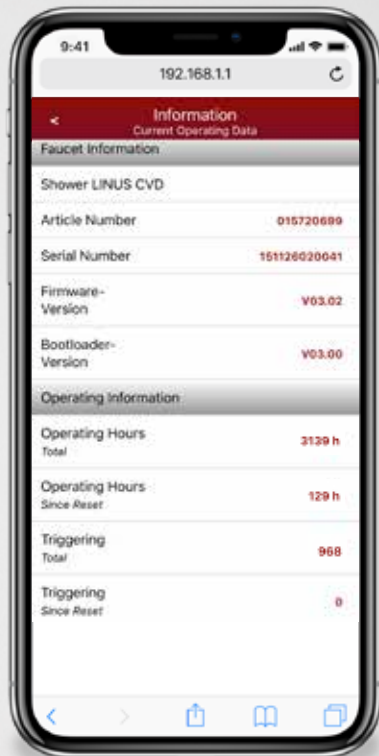
All fittings, bus extenders, sensors etc. integrated in the SCHELL water management system SWS are centrally configured, managed and monitored under the menu item "Devices". This allows, amongst others:

- simple setting of parameters for individual fittings such as flow time and sensor range
- grouping of fittings with identical parameters for simplified commissioning of fittings
- location-independent monitoring of each fitting integrated in the system and the set flushes



### Switching the cleaning stop

To protect employees when cleaning electronically controlled fittings, fittings or groups of fittings can be put into sleep mode. The persons who activate the cleaning stop can be defined via the user profile. Switching on and off can then also take place centrally via the water management system SWS.



... receiving all information  
at a glance ...



... or set parameters under  
"Configuration" .

## SWS menu: hygiene.

### Setting up stagnation flushes individually.

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The required stagnation flushes are created and managed in the SCHELL water management system SWS to ensure proper operation. They can be adapted to local conditions and user behaviour. You define how long the flow time of the flush is and whether it is cyclical, weekly, temperature-controlled or manually controlled by an external signal.



Open menu item  
"Hygiene" , ...



... select stagnation flush by  
type of flush and ...



**The following scenarios can be programmed:**

- The selected fittings flush cyclically every x hours for y seconds. The time calculation starts with the activation of the function.
- When flushing according to the weekly schedule, the user programs the weekday, time and duration of the flush.
- stagnation flushes are performed when a target temperature at a selected sensor is exceeded or not reached. Example: The cold water temperature exceeds 25 °C, the hot water temperature falls below 55 °C.
- Combinations of different stagnation flushes are also possible.

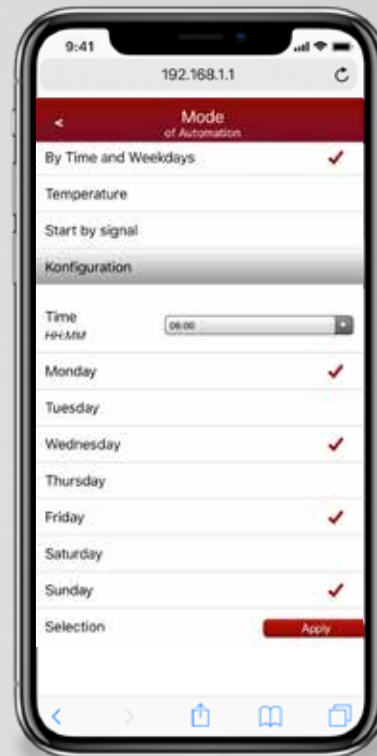


**Flushing according to weekly schedule**

Flushing according to a weekly schedule is particularly useful for many operators. In this case, for example, fittings 1, 2 and 7 flush on Mondays, Wednesdays, Fridays and Sundays at 06:00 hrs. This allows flushing to take place when there is supposedly no person in the sanitary room.



... under "Configure parameters" ...



... for example, set the trigger mode.

## Thermal disinfection.

### Safe protection for drinking water – and users.

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Thermal disinfection is not longer necessary – due to proper operation, but is still possible, for example after external contamination by a flood. The SCHELL water management system SWS provides a number of functions with which the operator can guarantee the protection of the users against scalding.

Due to the high water temperatures of 70 °C, thermal disinfection is a safety-critical measure and is therefore started manually. After the hot water tank has been heated up, the flushes are carried out according to a pre-programmed schedule. This process is repeated as often as necessary until all fitting groups have been flushed.

Thermal disinfection can be terminated at any time for safety reasons. This is done via the key switch or when a fitting is manually triggered in the area of the fittings to be flushed. Further safety measures, such as an emergency switch or a room sensor, can also be integrated into the system.

#### Hierarchy of safety functions

1. Cleaning stop: If the cleaning stop is activated, thermal disinfection and stagnation flushes are also prevented.
2. Thermal disinfection: This is a deliberately carried out measure to restore drinking water hygiene and is therefore above stagnation flushes.
3. Stagnation flushes: They run automatically according to the set parameters.

The building operator is solely responsible for the safety of the persons in the building.



**Personal protection has top priority.**

Thermal disinfection is terminated by actuating a fitting.



## Data security and updates.

### Encrypted communication – free update.

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The topic of data security is particularly relevant for wireless connections – and is a top priority for the SCHELL water management system SWS. Server, WLAN connection and wireless connection are secured. Updates have also been thought of: You will receive them free of charge.

Communication of the subscribers in the SCHELL water management system SWS is encrypted.

- The system is password-protected.
- Access rights can be defined via the user administration.
- The WLAN connection between the water management server and the network-compatible terminal device is WPA2-protected. This is currently the safest standard for wireless connections.
- The wireless bus extenders build up a wireless network with the server. This network type is optimized for building automation. The block encryption algorithm used is AES-128, which is classified as secure according to the state of the art.

By the way, the WLAN can be switched off or the WLAN module dismantled in security-critical buildings such as barracks, where WLAN is not permitted.

Like other software-based applications, the SCHELL water management system SWS is adapted to technical developments. We provide updates for all essential system components in the event of further development, which you can request free of charge.



#### How does AES encryption work?

AES (Advanced Encryption Standard) is a block cipher and offers a very high level of security. Each block is first written into a two-dimensional table with four rows, whose cells are one byte in size. Each block is now subjected to certain transformations one after the other. But instead of encrypting each block once with the key, AES applies different parts of the extended original key one after the other to the plain text block.



## **SWS menu: user/profile management.** **Defining and assigning access rights.**

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The SCHELL water management system SWS also makes daily small-scale work easier. User management provides different persons with defined access rights. For example, cleaning staff can automatically switch on the cleaning stop for a specific area.



Call up the start screen of the SWS software, ...



... open "User/Profile management" ...

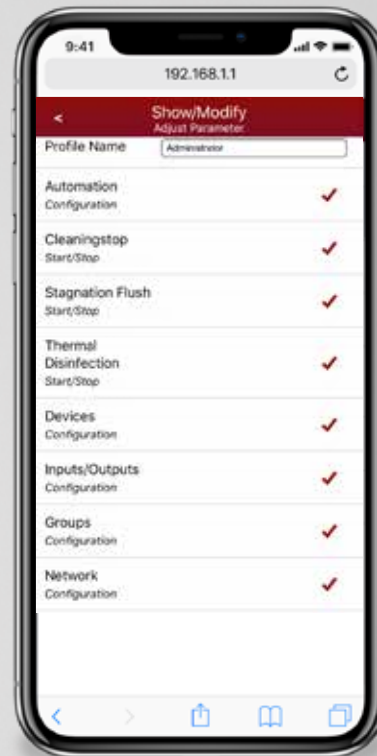
Each user has his own password, which he can change individually. The relevant functions for the respective user are activated under profile administration. These menu items are then visible to the user. This means that different persons can take advantage of the SCHELL water management system SWS without being able to influence other areas.

Preconfigured user profiles are:

- Cleaning staff
- Custodian
- Installer
- Administrator



... and for example  
manage users, ...



... to whom certain rights  
can be assigned.

## SWS gateways.

### Interface to the building automation system.

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Since the drinking water installation is part of the building technology, it can make sense to integrate the SCHELL water management system SWS into the building automation system (BAS). The only requirement: one of the SWS gateways. This is the interface to all common building automation systems.

Communication via SWS gateways takes place in the form of a request from the building automation system on the current status of a data point (e.g. temperature). The SWS gateways “translate” the request and receive from the water management server the data they translate in turn and forward. The BAS can use SWS gateways to call up selected information from the SCHELL water management system SWS. Intelligent protocols such as BACnet can also write trends by querying a certain state at a regular time interval.

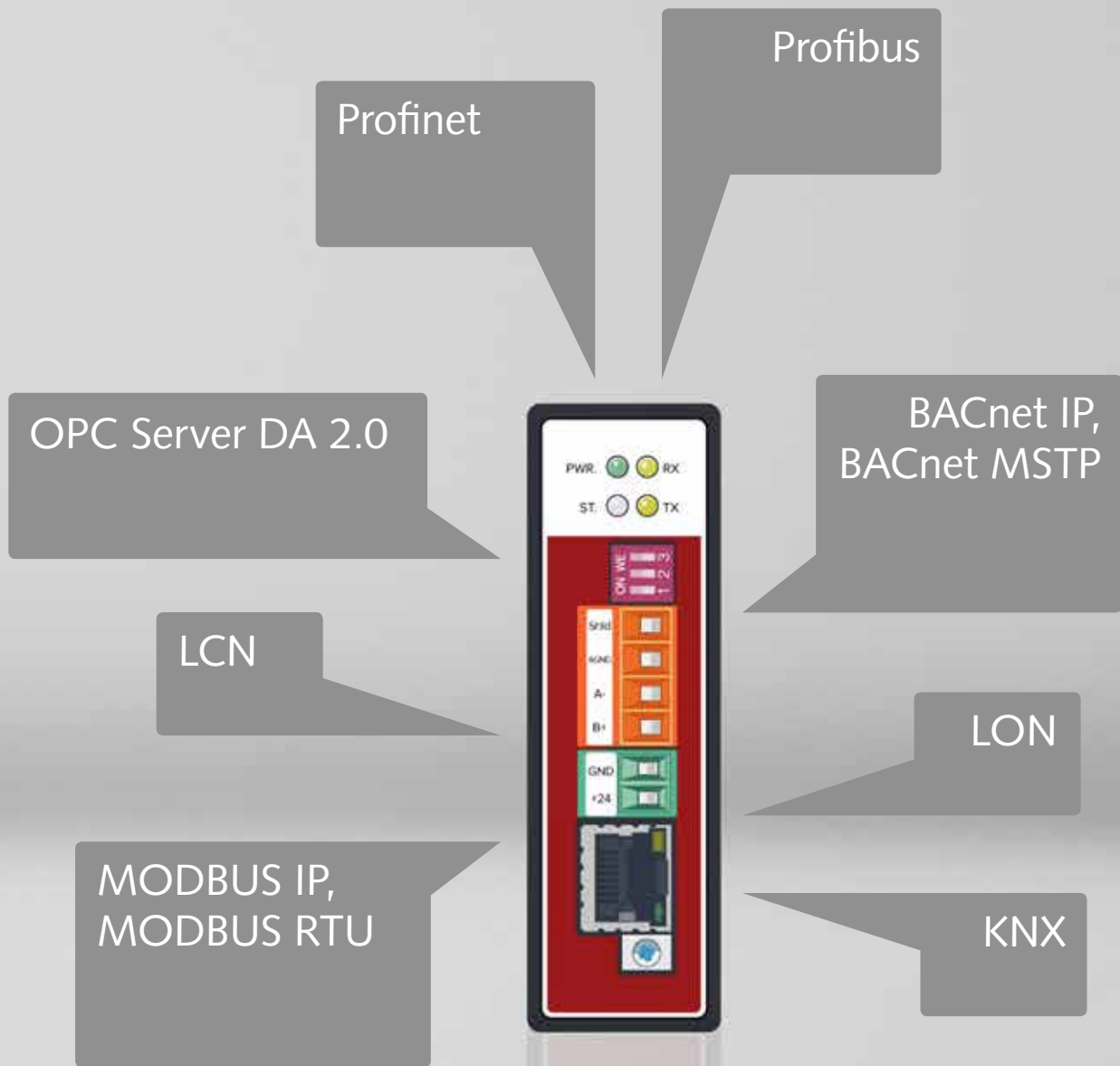
SWS gateways are available for all common standard protocols. Each SWS gateway is available for 200, 500, 1,000 and 2,500 data points. As a rule, only the most important data points are implemented per fitting (fitting switching, temperature, error code). The data points can easily be upgraded by purchasing additional data points without changing or expanding the hardware. The operator decides which data points are to be monitored by the building automation system.



#### What is a data point?

A data point describes a setting or a status of the fitting or the server (e.g. solenoid valve, flow time, range, temperature, fault message etc.). The sum of all data points is determined by the operator in consultation with the building automation administrator (BAA) on the basis of his requirements.



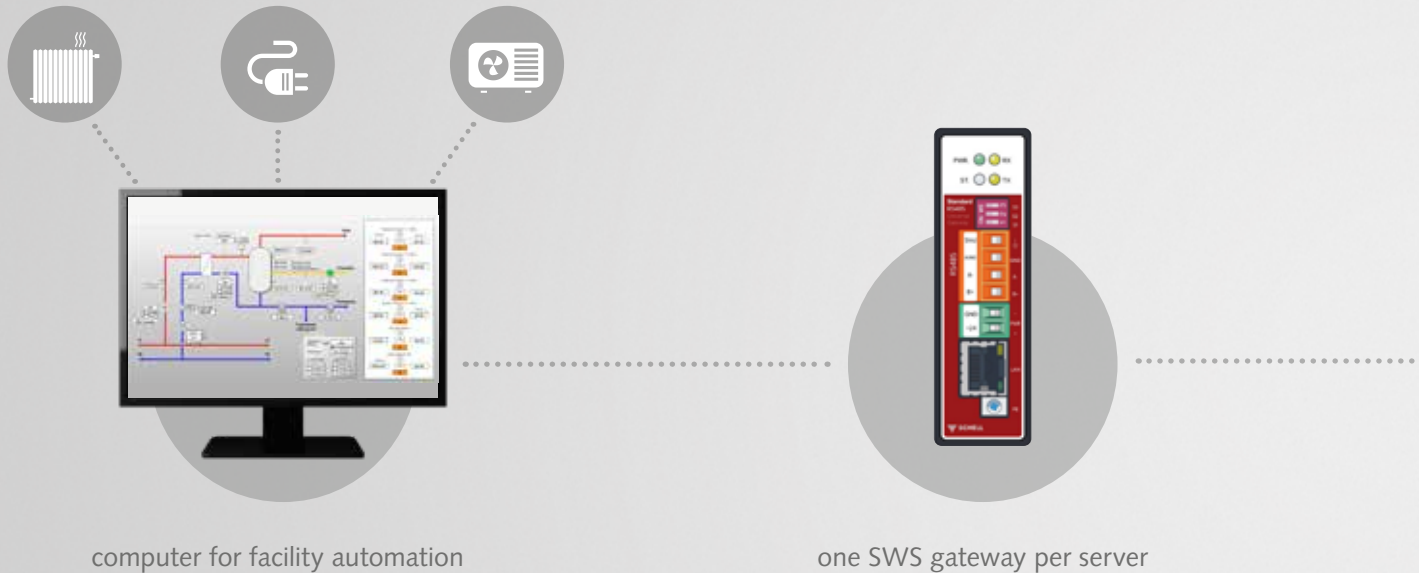


## Integration in building automation systems. All technical building functions at a glance.

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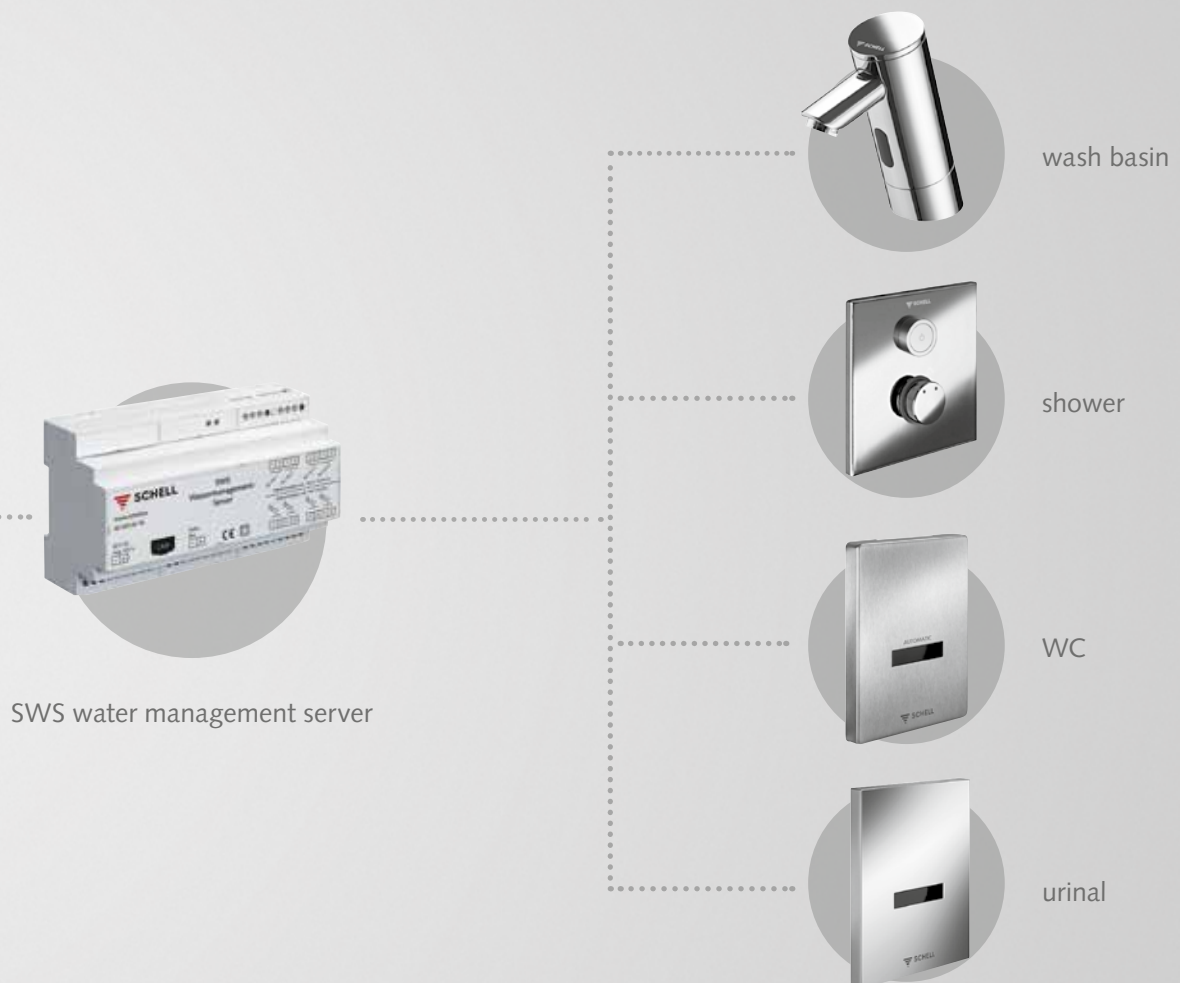
Building automation systems (BAS) are often already standard for high-quality commercial properties and public buildings today. An advantage: You can see at a glance whether the technology works perfectly. If the SCHELL water management system SWS becomes part of the building automation, you can monitor or control the technical functions of the building centrally and without changing the view.

### Integration of the SCHELL water management system SWS Integration in building automation system via gateway



Two procedures for the integration of the SCHELL water management system SWS into the BAS are common:

- The SCHELL water management system SWS works "autonomously", temperature trends are recorded if necessary. Possible error codes are queried by the BAS at rhythm X, and the system is monitored in this way.
- The SCHELL water management system SWS is used to forward commands from BAS to the fittings. For example, hygiene flushes can be triggered directly by changing the state of the solenoid valves (open/closed).



## **Advantages in planning, installation and operation.**

### **Out of the danger zone – into a safe future.**

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#### **Safe drinking water hygiene**

- assured drinking water quality thanks to reliable water exchanges through automated stagnation flushes
- qualified water exchanges due to turbulent flow
- more planning flexibility for new buildings and restorations

➔ from p. 30

#### **Modern facility management**

- central and location-independent control of the drinking water installation's operation
- efficient execution of the required stagnation flushes and its documentation
- value of the property maintained through modern maintenance and targeted error messages

➔ from p. 50

#### **Drinking water installations of the future**

- meeting increased customer demands
- easy installation due to few components and central set-up
- comprehensive service by SCHELL through training courses and consultations

➔ from p. 60



Safe drinking water hygiene

Modern facility management

Drinking water installations of the future

## Complying with acknowledged rules of technology. Safety in planning, construction and operation of drinking water installations.

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Drinking water in Germany is top of the line, but it takes a bit of effort to ensure quality. To this end, the legislator has enacted various provisions. For the preservation of drinking water quality within the building, relevant regulations such as DIN EN 806, DIN 1988, DVGW W551 and VDI 6023 apply.

Paragraph 4(1) of the German Drinking Water Ordinance (TrinkwV 2018) states: "Drinking water must be such that its consumption or use does not harm human health, particularly through pathogens. It must be pure and edible. This requirement shall be deemed to be fulfilled if at least the generally recognised rules of technology are complied with in the extraction, treatment and distribution of water and if the drinking water complies with the requirements of Articles 5 to 7a."



### Planning, construction and operation in compliance with regulations

Anyone who considers at least the generally recognised rules of technology during construction, planning and operation can assume that the requirements of the Drinking Water Ordinance have been met.



### The benefits of SMART.SWS

With its clearly structured dashboard offering visualisations of system data, SMART.SWS summarises operating parameters for users (VDI 6023).

## Relevant rules and regulations for the preservation of drinking water quality

### VDI 6023:

#### 6.1 General planning rules

##### Important note:

Intended operation must be established here where at each point of the drinking water installation a **water consumption by drawing-off** within 72 hours is ensured.

**Comment:** Lack of exchange of water for over 72 hours is considered a service outage.

### German Drinking Water Directive:

#### § 4 General requirements

(1) Drinking water must be such that its consumption or use does not harm human health, particularly through pathogens. It must be pure and edible. This requirement shall be deemed to be fulfilled if

1. in water extraction, water treatment and water distribution, at least the generally recognised rules of technology are observed, and
2. the drinking water meets the requirements of §§ 5 to 7a.



### German Drinking Water Directive:

#### § 17 – requirements for installations for the abstraction, treatment or distribution of drinking water

(1) Installations for the abstraction, treatment or distribution of drinking water must be planned, built and **operated** at least according to the generally recognised codes of practice.

### VDI 6023:

#### 3. Terms

##### Intended operation

Operation of the drinking water installation (...), if necessary by the **simulated draw-off** (manual or automatic flushing)

**min. 3 days**  
complete exchange of water



**max. 7 days**  
extension with hygienic proof



## Permanently safeguarding high drinking water quality. Completely turbulent water exchange after 3 days.

Even the ancient Romans knew that water had to flow to stay fresh. This is no problem even today with daily use. It only becomes critical when the water in the pipes stagnates – for example when the consumers are absent or when operations are interrupted. The solution: Water must flow – every three days at the latest.

Pipes in which the water stagnates are so-called dead pipes. This can be the case permanently, for example in the case of incomplete dismantling – or temporarily if the fitting is not operated. Especially critical: Water and room air come

into contact via the fitting, bacteria can easily penetrate the water retrograde. **This risk can only be mitigated by regular collection.**

Hygienically acceptable stagnation times and measures to be derived from them in accordance with the regulations

Duration of operations interruption	Measure for decommissioning	Measure for recommissioning
over 4 hours <sup>1)</sup>	none	complete water exchange before the water is used as food
up to 3 days <sup>2)</sup>	none	none if not used as food
up to 7 days <sup>3), 4)</sup>	none	complete water exchange
> 7 days <sup>4), 5)</sup>	shut off	complete water exchange
more than 6 months <sup>6)</sup>	shut off	Flushing of the installation e.g. according to EN 806-4; recommended: microbiological tests
more than 12 months <sup>7)</sup>	Disconnect connecting line at the supply line	Filling and flushing of the installation, e.g. according to EN 806-4; recommended: Sampling depending on type of use

<sup>1)</sup> Information "Trink Was – Trinkwasser aus dem Hahn" of the Federal Environmental Agency

<sup>2)</sup> VDI 6023<sup>3)</sup> VDI 6023: only permissible with perfect water quality, DIN EN 806-5: always permissible

<sup>4)</sup> DIN EN 806-5: A period of over 7 days is considered to be a service outage.

<sup>5)</sup> DIN 1988-100: Rarely used services (e.g. stub lines to guest rooms, outbuildings, external taps) require an exchange of water at least every four weeks. EN 806-5: water exchange preferably once a week

<sup>6)</sup> DIN 1988-100: leave in filled condition and shut off at house connection

<sup>7)</sup> DIN EN 806-5: "Drain". But: Drainage increases the corrosion probability according to DIN EN 12502.

## Bacteria in drinking water installations. Bacteria are unavoidable – and partly desired.

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Bacteria occur – and are allowed to do so. In drinking water installations, they inevitably form a thin biofilm on all surfaces that come into contact with water, which in some cases is even beneficial. The colonisation with harmless bacteria makes infestation with pathogens less likely. It is therefore necessary to manage the biofilm by suitable materials and proper operation – it cannot be avoided.

In § 4 (1) of the Drinking Water Ordinance, no sterile drinking water is required. Even a potential pathogen such as *Legionella pneumophila* may occur in limited numbers. However, the concentration must be so low that it does not make the normal user ill.

Many bacteria form a biofilm. It consists mainly of water and substances excreted by bacteria (EPS = extracellular polymeric substances). This gives them a survival advantage because the biofilm protects them from drying out, flushing out and destroying them with chemical disinfectants.

In principle, biofilm in drinking water installations cannot be completely removed by any approved method, but it can be reduced. More is not even desirable. The specialists and renowned experts assume that biofilms can only be managed.

Research has shown that biofilm is even desirable for the biological balance in drinking water installations because pathogens such as *Pseudomonas aeruginosa* are often unable to conquer this habitat or are even displaced by normal bacteria.

### Biofilm management: Three essential factors limit excessive bacterial growth in drinking water installations:



#### Nutrients

The supplier's drinking water contains only small concentrations of nutrients. However, other nutrients may be released by unsuitable plastics. It is therefore important to use only plastics that are compliant with drinking water regulations.



#### Temperature

Pathogens usually grow optimally at body temperature, that's about 37 °C. Technically this means that cold water should not be warmer than 25 °C and hot water should not be colder than 55 °C.

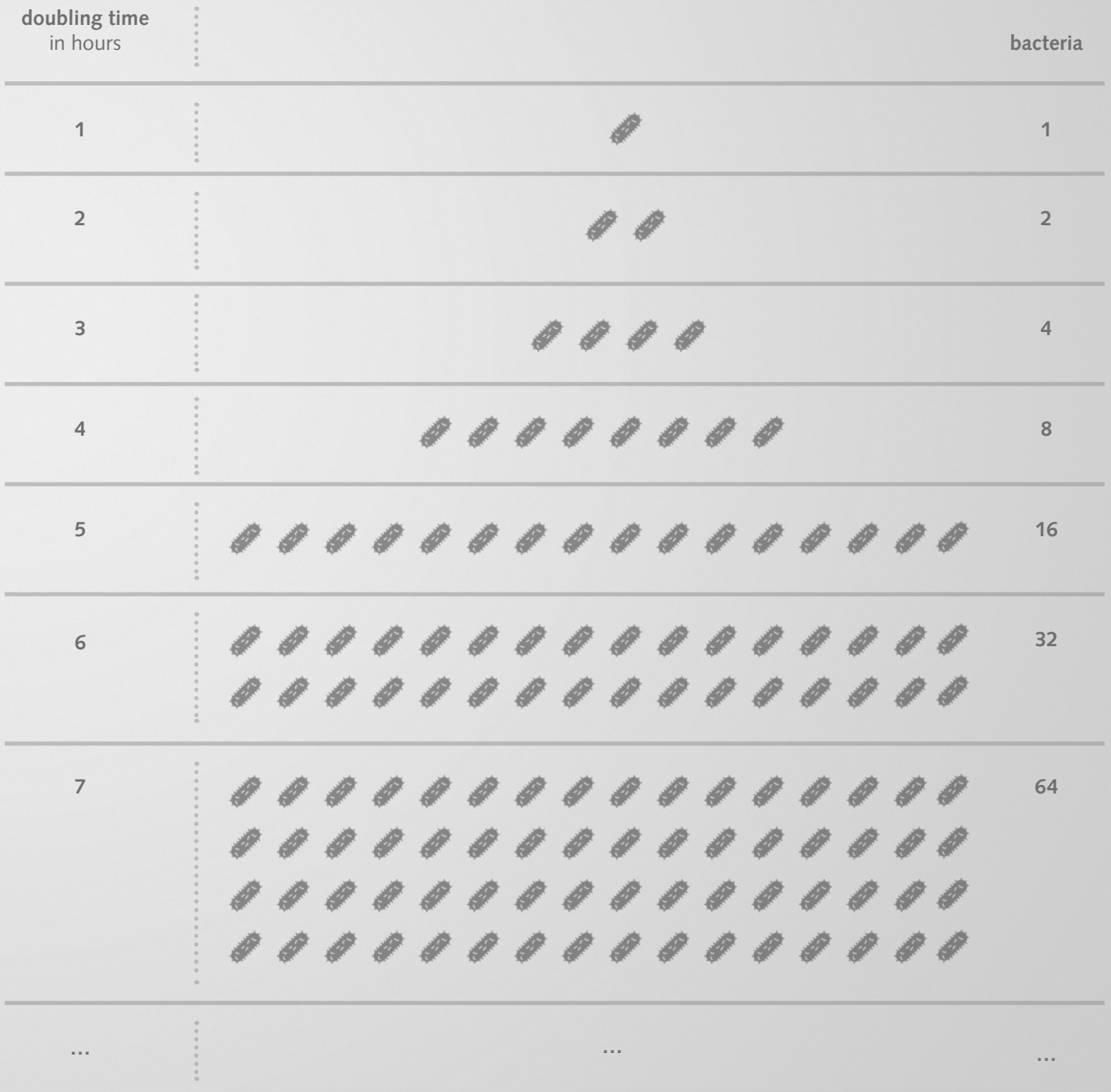


#### Time

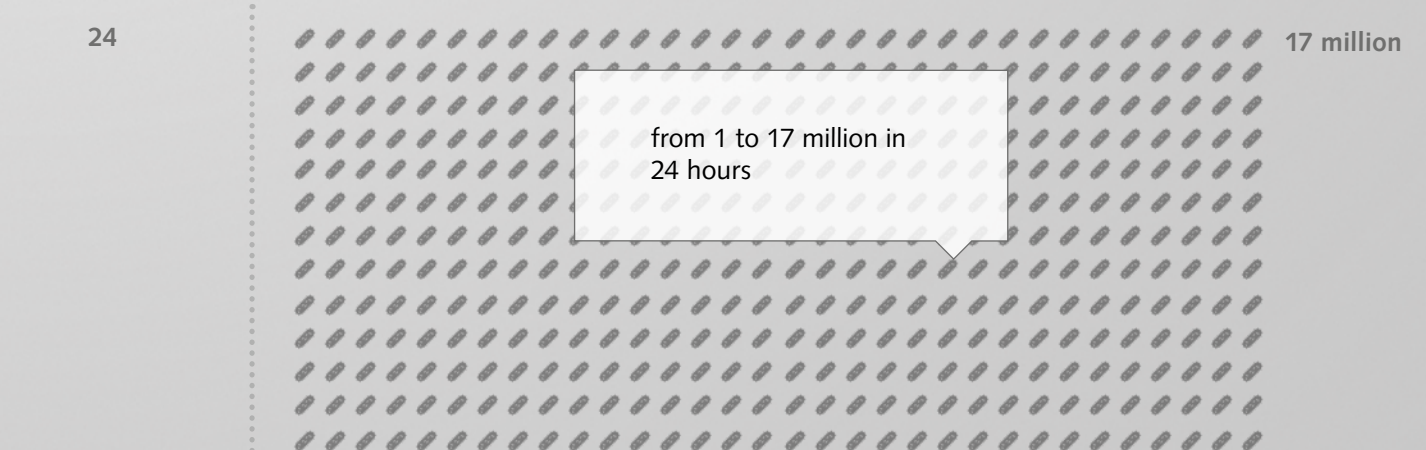
Bacteria need time for excessive propagation – which can be taken from them by a regular and complete water exchange. Then the “dilution rate” is higher than the propagation rate – and the bacteria numbers remain in the non-critical range.

Only if all three factors are taken into account at the same time is the drinking water at the tapping points of faultless quality.

# Bacterial growth

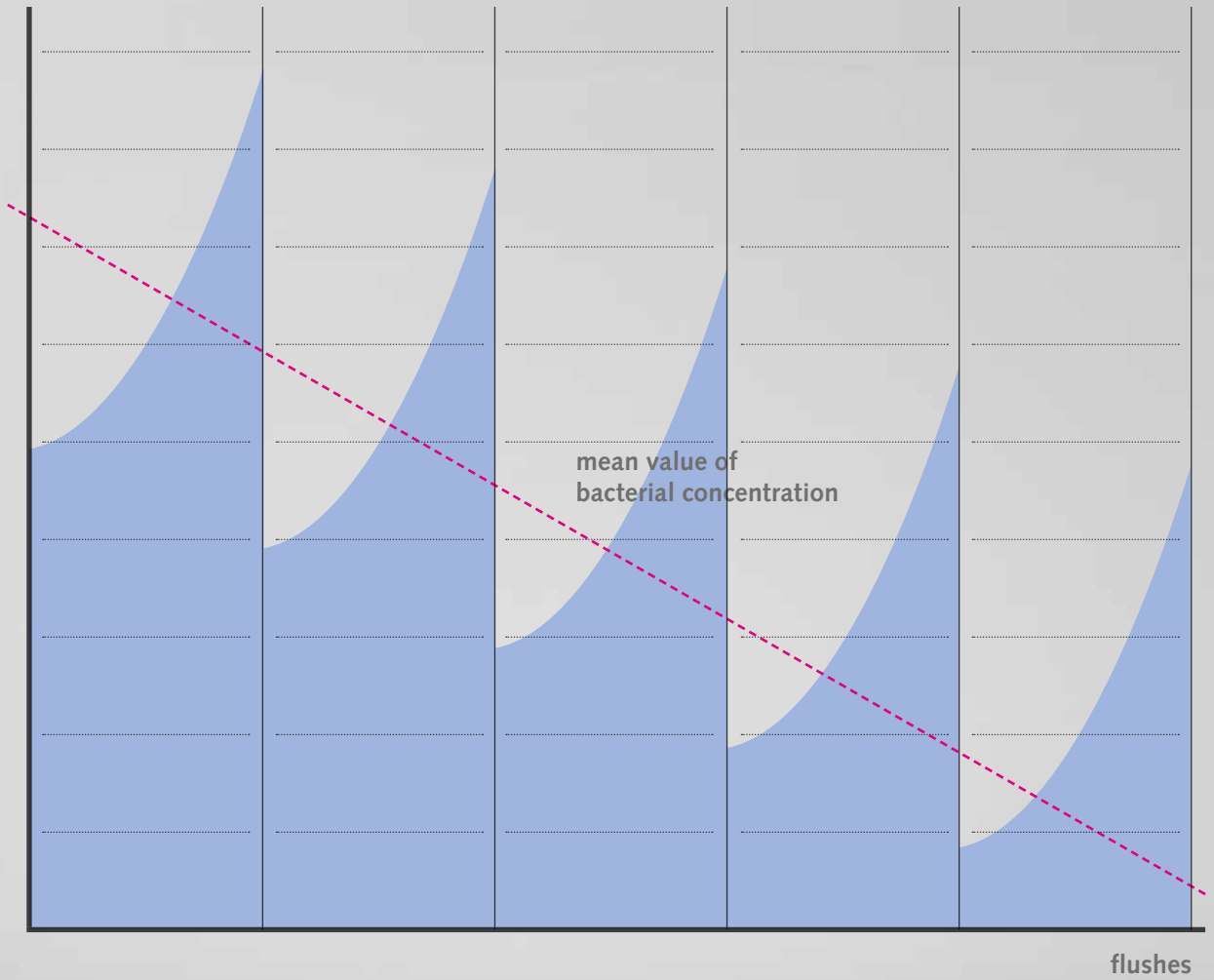


Safe drinking water hygiene



# Permanently reducing bacterial concentration with regular water exchange

bacteria in  
drinking water  
CFU\*/ml



\*colony-forming units = bacteria capable of reproduction



## Planning possibilities.

### Preventing bacterial growth.

---

The high water quality of the supplier is maintained in the building if only products made of tested materials are used in professionally planned and executed drinking water installations and if a regular water exchange with perfect drinking water “cold” of max. 25 °C and “warm” of at least 55 °C takes place via the tapping points.

#### The three essential growth factors for bacteria that can be met technically:



##### Minimizing nutrients

Planners and installers demand and install only microbiologically tested materials. These are tested for microbiological growth according to DVGW W 270. **SCHELL only uses tested materials for water-carrying components. This also includes microbiological tests to ensure that bacteria do not provide any additional nutrients via the plastics.**



##### Limiting temperature

The operator must ensure that the temperatures in the entire hot water range are above 55 °C (hot water tank 60 °C, circulation system at least 55 °C) and that the temperatures in the cold water range are max. 25 °C. **The SCHELL temperature sensors can be used to check compliance at the tapping point and in the system.**



##### Limiting time

The operator must ensure a complete water exchange every three days (72 hours). This interval may be extended to a maximum of seven days if hygienic conditions are present (VDI 6023-1).



**Tested with air instead of water**

Every SCHELL sanitary fitting is tested for tightness and function with differential air pressure before delivery. This is more accurate and prevents residual water in the fitting, which would lead to a breeding ground for bacteria and thus to a risk for the new drinking water installation. Our fittings leave production in technically and microbiologically perfect condition.

## Basic planning principles.

### Preservation of water quality.

---

The basic principle of a hygienically safe installation is to keep the amount of stagnant water within the pipes as low as possible. This is achieved by a “slim” installation with limited lengths and small diameters, the arrangement of the tapping points, the avoidance of dead lines and ensuring regular tapping.

#### Essential planning principles for hygienically safe installations

- Drinking water installations should contain as little drinking water as possible – this will result in a high water exchange during normal operation.
- Stub lines should be as short as possible and must not exceed three litres in PWH and PWC.
- Dead lines must be removed from the existing pipe assemblies (DIN 1988-200, Section 8.1) – if possible to a maximum of  $2$  to  $3 \times D$  (diameter of the through line).
- According to EN 806-2 chapter 8.1, tapping points must be arranged according to their frequency. This rule does not apply to fittings with stagnation flushes, as they are all “frequently used”.
- To prevent the cold water from heating up and the hot water from cooling down, cold and hot water installations should be installed in separate shafts.
- With horizontal installation, the cold water pipe must always be arranged at the bottom.

shower



For decades there were practically only T-piece installations. They still comply with the generally accepted rules of technology. If the fittings are used regularly or flushed regularly manually or automatically during interruptions in use, they are on a par with other installation methods in terms of hygiene, and may even be superior in some cases due to shorter pipe lengths and dimensions as well as smaller volumes.

By looping in and cleverly arranging the consumption points according to the frequency of use, ring and series pipes ensure the water quality up to shortly before each tapping point. They also enable central flushing of pipe routes via flushing stations. Then only small amounts of water need to be used via the fittings or flushed out if there are interruptions in use.

**They all have one thing in common: Without a regular exchange of water via the tapping points, even short pipe sections or small components become dead pipes that harbour hygienic risks (VDI 6023).**



#### When do flushing stations make sense?

The VDI 6023 requires a water exchange via the tapping points: Therefore, flushing stations cannot replace water exchanges via the tapping points.

urinal



wash basin



WC



## Preventing service outages. Planners and operators are responsible.

---

Proper operation to maintain water quality cannot be guaranteed by planning alone. Users and operators are responsible here. They may assume that a new installation has been carried out in such a way that it enables the water quality to be maintained during normal operation.

VDI 6023 assumes that an interruption in operation is already present after 72 hours without use and that hygienic risks could have arisen. A long weekend makes a complete water exchange necessary, for example in schools or office buildings.

This time span is also quickly reached in the hotel industry with low occupancy in the off-season – as is the case with a short trip by the tenant/owner of the flat or with irregular use of the taps. In these cases, despite regular use in other parts of the building, the water quality in the entire installation is at risk. At the junction to the unused unit, water vortices form, which repeatedly allow water containing

bacteria to enter the water stream from the supply line to the unused unit. In case of a very long absence, at least the shut-off devices required according to DIN EN 806-2 chapter 7.1 must be closed per unit of use if no stagnation flushes takes place.

With the SCHELL water management system SWS, interruptions to operations are a thing of the past. The required water exchange is carried out reliably and safely by the centrally installed stagnation flushes. This can be controlled via the system at any time and is also recorded seamlessly and tamper-proof. Optionally, the uses can also be recorded.



# School holidays, public holidays and weekends 2019

## the example of North Rhine-Westphalia



🏫 School    😞 No school    🇩🇪 Customs Day (regionally different)

## The smart solution.

### Controlling automatic stagnation flushes centrally.

---

The SCHELL water management system SWS secures the intended use of the operation and thus the drinking water quality. You can set up and control stagnation flushes centrally and document them reliably.

Even the use of non-networked electronic fittings can ensure proper operation by regular stagnation flushes in individual areas of the building. However, the effort increases with the size and complexity of the installation, as it becomes more and more difficult to set up and control stagnation flushes, for example. This problem does not exist with networked fittings.

With the SCHELL water management system SWS, the installation, execution and control of stagnation flushes are centrally possible. Stagnation flushes can be selected by the building operator according to the following criteria:

- cyclic: regularly every XY hours
- by time and day of week: for weekly flushing plans
- temperature: in combination with a temperature sensor when the water temperature in the installation falls below or exceeds a specified value
- start by an external signal

The building can be operated according to the generally acknowledged rules of technology and thus without hygienic risks, and the operating conditions can be monitored even remotely. In addition, all stagnation flushes are fully documented.

In the event of later conversions in the building, the stagnation flushes can be easily and centrally adapted to increased or reduced use. This provides additional flexibility in planning and operation.





Safe drinking water hygiene

## The “pipe-in-pipe” phenomenon



## Oversize piping. Stagnation despite tapping.

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In buildings that are used by many people at peak times, the piping must be designed for this maximum use. If only a few fittings are used during the rest of the time, stagnation may occur in the area of the pipe wall despite tapping. In order to achieve a qualified water exchange, a turbulent current must be created.

The litre capacities per second of tapping points and their simultaneous use are essential influencing factors for the dimensioning of drinking water installations. They are defined as follows in DIN 1988-300:

- **Calculation of flow rate:** flow rate of the fittings for the planning
- **Total flow:** sum of all calculated flows
- **Peak flow:** flow rate taking into account the probable concurrences of water withdrawal via tapping points occurring during operation; this is the flow rate relevant for the hydraulic calculation.

When specifying stagnation flushes via the SCHELL water management system SWS, these planning specifications must be taken into account, e. g. with regard to the number of simultaneously flushing tapping points. Only in this way can a sufficiently high flushing speed and turbulent flow up to the pipe wall be achieved in large dimensioned pipelines and a qualified water exchange be brought about.



### Turbulent flow required

Only a turbulent flow leads to a qualified exchange of water. Particularly with large pipe diameters, this can only be achieved by flushing several fittings simultaneously.

## Grouping and synchronised flushing. Reaching maximum flushing speed.

---

In order to guarantee qualified water exchange with large pipe diameters by means of turbulent flow, fittings can be combined in groups and flushed synchronously with the SCHELL water management system SWS for stagnation flushes.

When programming the stagnation flushes in the SCHELL water management system SWS, several subscribers can be grouped together. They all flush at the same time according to the defined parameters. This simulates full utilisation of the installation and flushes the entire pipe system at a sufficiently high flushing speed. Bacteria, which might have been able to stay in otherwise less moving water in the area of the pipe wall, are carried along and flushed out.



# Water ... go!

Simulating peak flow rate



**120l/min**

## For new construction and restoration. More flexibility in planning – today and in the future.

---

The planning challenge in new buildings and renovations: constantly changing requirements by users, operators and owners, to which the building is to be adapted. This is no problem for drinking water installations with the SCHELL water management system SWS.

Where is which tapping point located on the line section? It is not uncommon for architectural specifications to collide with legal requirements. According to EN 806-2 chapter 8.1, tapping points must be arranged according to their frequency of use. This rule can already be defused by the use of fittings with stagnation flush, because then there are no more rarely used tapping points. You become permanently independent with the SCHELL water management system SWS.

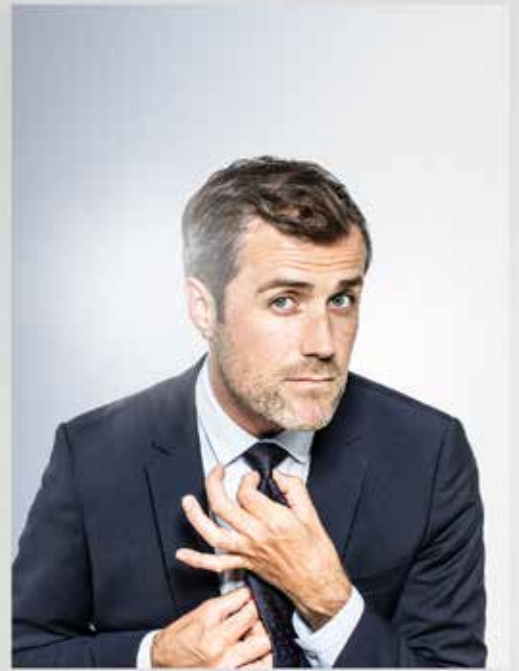
In the case of a renovation, you can reliably bring about the required water exchange even in the case of unfavourable existing placement of a tapping point and thus less frequent use. Costly dismantling can be avoided. In the case of new construction, you are already flexible in the current planning of the pipelines by means of electronic fittings. However, future changes in use can also be easily responded to by simply setting up new stagnation flushes centrally as required.

Another advantage for more flexibility: Ease the frequent discrepancy between peak flow and daily consumption, which can cause water to stagnate despite being drawn from the pipes (see p. 45). This is particularly relevant for renovations, since in the past pipe diameters were often chosen very large, but these quantities of water are no longer needed today. By forming groups and flushing several fittings simultaneously, the peak flow can still be simulated, saving existing installations. But you can also react more flexibly to customer requests for many tapping points or flexible conversion of individual rooms in new buildings.





**Permanent safety**  
also in case of changes of use



## New approaches in facility management. Central management instead of long distances.

---

Commercial real estate is a valuable investment and at the same time a place of added value. Modern facility management has the task of looking after the property in such a way that it is fully functional and retains its value. An ever more complex building technology is the challenge – the SCHELL water management system SWS is your innovative assistant.

The term “Graduated Custodian” is sometimes used with a smile, but facility management is a master's degree course for engineers. Ten years ago hardly anyone knew the term, let alone the job description. Today the profession has established itself as an exciting, challenging job with little history, but a lot of future.

For all major construction projects, facility management is a variable calculated prior to construction. The goal is to save energy, relieve the burden on the environment, operate cost-consciously and to secure or increase the value of the property in the long term. In addition, people should be offered optimal working and experience spaces. Modern digital technology makes planning, controlling and steering technical processes much easier than before. The building and its technology provide information that can be captured and reused. The building becomes smart – “smart public”.



### Operators are obliged

The drinking water ordinance makes reference to the generally accepted rules of technology. They specify concrete measures to be taken by the operator of a drinking water installation in the event of interruptions in operation: A complete water exchange must take place after only three days. This is an important task that must be performed by facility management.



### Preventive maintenance of drinking water installations

The central control and monitoring of the fittings, the prescribed hygiene flushes and their documentation with the SCHELL water management system SWS saves the need for tours through the building and manual operation of all fittings.

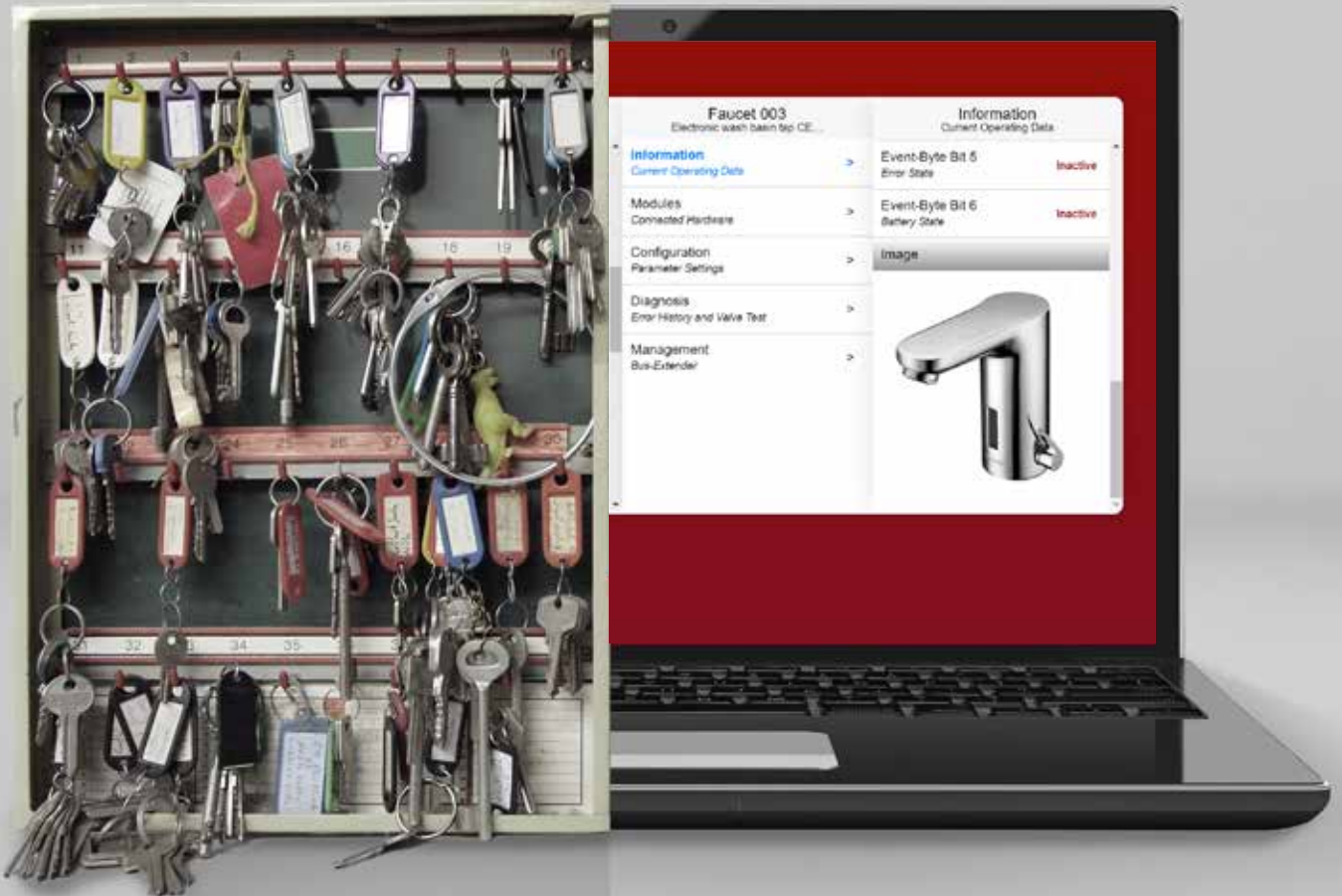


### Benefits of SMART.SWS

Whatever their current location, facility managers can use SMART.SWS to access data about any building, including system messages and the water consumption (calculated) of networked fittings. To ensure only relevant buildings/fittings are displayed, access rights can be assigned individually by the system owner beforehand.

# 1985

Manual execution of stagnation flushes



# Today

Intelligent, centralized water management

Now even easier:  
Overview with  
SMART.SWS



## Example calculations for operating costs. Low water consumption with stagnation flushes.

---

Stagnation flushes simulate the use – but not normal operation. They ensure proper operation, i. e. at least the required water exchange. This consumes far less water than the daily operation by the users.

<b>Example: In the hotel</b>	
Assumed water consumption per double room (2 × personal hygiene, 2 × toilet, 1 × room cleaning)	152.6 l <sup>1)</sup>
Water consumption double room per month with full occupancy	4,641.58 l
<b>Costs for drinking water per double room</b>	<b>15.85 €<sup>3)</sup></b>

*Company holidays/no occupancy in February and November*

Water consumption per stagnation flush <sup>1)</sup>	10 l <sup>2)</sup>
Water consumption for 10 stagnation flushes per month	100 l
<b>Costs for intended use per month per double room</b>	<b>0.34 €<sup>3)</sup></b>

<b>Example: In a 2-person household</b>	
Average daily water requirement of a person	12 l <sup>1)</sup>
Average water consumption of a 2-person household per month	7,36 l
<b>Costs for drinking water for 2-person household per month</b>	<b>25.13 €<sup>3)</sup></b>
Water consumption per stagnation flush	30 l <sup>2)</sup>
Monthly consumption at three-day rinsing interval	304.16 l
<b>Costs for intended operation per month (independent of the number of persons)</b>	<b>1.04 €<sup>3)</sup></b>

The difference in costs between everyday use and compliance with the intended use becomes clear when both consumptions are compared. The basis is the price for 1,000 litres of water in Düsseldorf, Germany, of 3.4146 € (Water: 1,8946 €/m<sup>3</sup>, waste water: 1,52 €/m<sup>3</sup>) without basic fee.

<sup>1)</sup> Average daily water consumption of a person, determined by the Federal Statistical Office

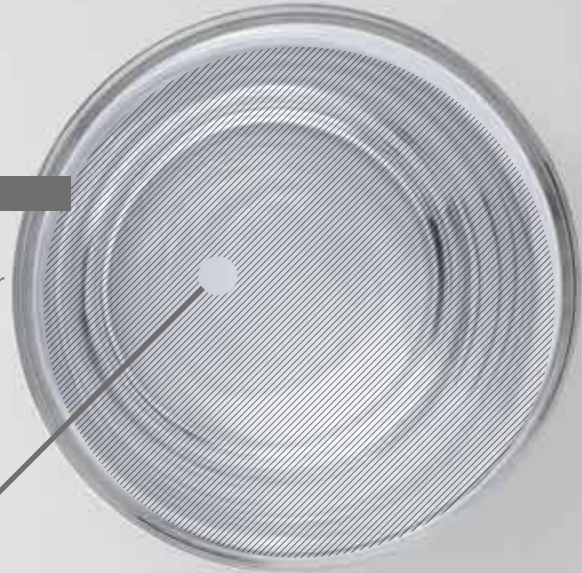
<sup>2)</sup> Significantly lower water consumption, as “only” the pipes have to be flushed out

<sup>3)</sup> Base: 3,4146 € for water and waste water



### Hotels

**15,85 €/Mon.**  
Costs for drinking water  
per room



**0,34 €/Mon.**  
for stagnation flushes during  
interruption of operation

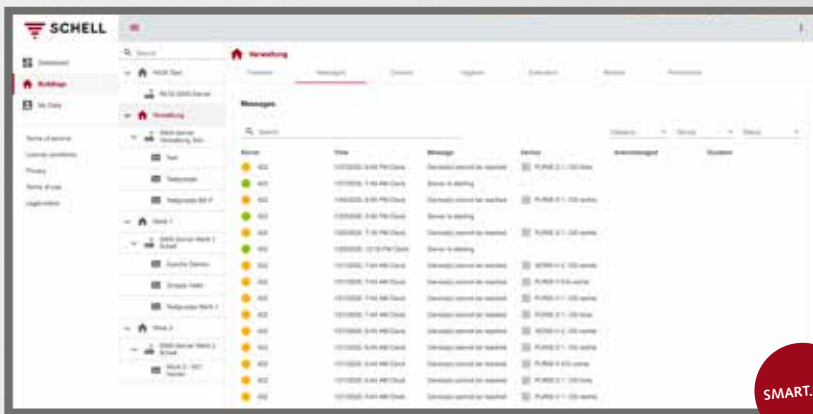
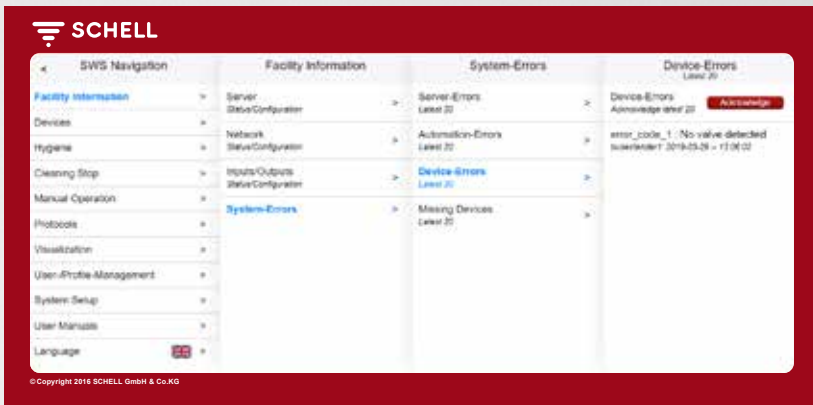


### 2-person household

**25,13 €/Mon.**  
costs for drinking water



**1,04 €/Mon.**  
for stagnation flushes  
during 4 weeks vacation



## Diagnostics

- The following functions are available:
- The SWS water management server automatically scans fittings and can output a signal – for example via a warning light – indicating a defect.
  - All error messages are logged in a CSV file.
  - The data can be output and analysed as an Excel file.
  - SMART.SWS visualises key operating parameters in a user-friendly dashboard.



## Documentation

- The following states are stored in CSV files:
- user behaviour (the function can be switched off for data protection reasons).
  - stagnation flushes (in separate file), malfunctions are also documented.
  - thermal disinfection with possible fault messages
  - all system errors
  - cleaning stops (you can prevent hygienic flushing, see page 30).
  - temperatures of the integrated sensors (every 15 minutes)
  - for hygienic flushing, the temperature is documented every 15 seconds.
  - SMART.SWS gives you regular, attractively presented reports about flushes, temperatures and more.



SMART.SWS

## SWS diagnostics and documentation.

### Everything at a glance – and always under control.

The SCHELL water management system SWS is the smart solution for the management of public buildings. You can see, for example, whether the fittings have been operated, where there may be an error, whether the batteries are about to run out and whether all stagnation flushes have been triggered. This is also logged in a tamper-proof manner.

The SCHELL water management system SWS facilitates location-independent control of all networked fittings. Errors can be read out centrally. Necessary repairs can thus be performed in a targeted and efficient manner. Intuitive operation via all common Windows PCs, tablets and smartphones (iOS and Android).

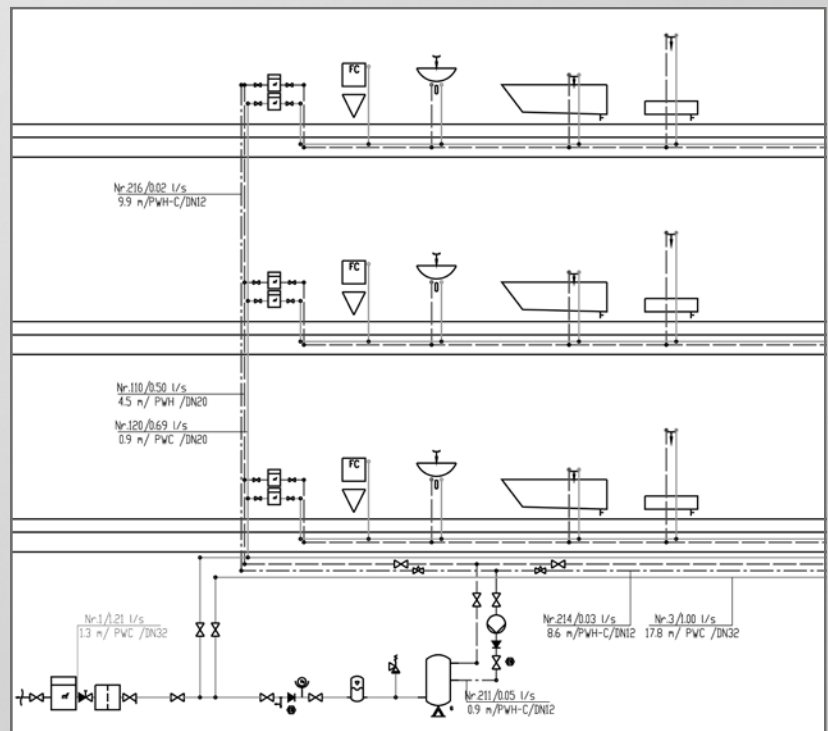
In addition, the operation of the drinking water installation is also logged. The data of the server can be read out with common office software. Of course they are tamper-proof and preserved in the event of a power failure. The documentation serves as proof of the intended operation and allows the optimisation of the installation in the building – and thus of the facility management.

For optical support, it is possible to scan building drawings. In these plans, symbols of the fittings in the system can be incorporated with the mouse and linked to the settings of the respective fitting.



#### Data security on the SWS water management server

All data is stored as CSV files on the SWS water management server in a tamper-proof manner. They can be read out with all common text programs. Access is password-protected.



## Efficient operation of real estate.

### Save time and labour costs through central control.

The manual execution of the necessary stagnation flushes is generally associated with a considerable expenditure of time. Networked fittings save labour costs, relieve facility management – and provide a high degree of legal security by documenting all operating states.

#### Example scenario

In a hotel with 100 rooms there are company holidays in February and November. During this time, stagnation flushes must be carried out in order to guarantee proper operation. In the remaining ten months, the occupancy rate is 70 percent. For the remaining 30 percent, manual flushing must also be carried out. In addition, there are flushes in the SPA area and in the toilets in reception and conference areas.

Basic data	
Hourly wage (minimum wage) <sup>1)</sup>	8.84 €
Time required per flush <sup>2)</sup>	Flushing process <sup>3)</sup> 3 min. walking distance <sup>2)</sup> 2 min
<b>Time required for 100 rooms per flushing day</b>	<b>8.33 hours</b>

Wage costs	
Monthly wage costs for manual flushing during company holidays (10 flushing days per month)	736.37 €
Monthly wage costs for manual flushing of unoccupied rooms during operation	221.00 €
Monthly wage costs for manual flushing of the remaining fittings	100.00 €
<b>Annual labour costs for manual flushing</b>	<b>4,883.00 €</b>
<b>Plus 22.4 % incidental wage costs</b>	<b>6,000.00 €</b>



#### Implementation and parameterization

Fittings networked with the SCHELL water management system SWS facilitate not only facility management but also commissioning thanks to the central control system. The system saves the time-consuming parametrisation of each individual fitting on site, fittings can be grouped together. Set-up is only required once and can then be made from any location (see p. 63).

<sup>1)</sup> Experts cost accordingly more.

<sup>2)</sup> Without hygienic controls such as temperature measurements and without documentation

<sup>3)</sup> In order to generate a turbulent flow, the fittings may have to be opened simultaneously in several rooms. The walking distances are extended accordingly.



## Annual wage costs for legally prescribed stagnation flushes



**15,500 €**

annual wage costs incl. additional costs for a skilled worker with an hourly wage of 23,00 €



**6,000 €**

annual wage costs including ancillary costs for an employee with a minimum wage of € 8.84

## Efficient operation of several properties. Central building control system as a basis.

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Facility management employees often manage several buildings – a central building control system ensures efficiency. The SCHELL water management system SWS can be integrated into it.



The increasing complexity of building management with correspondingly higher demands on quality, resources and know-how is leading to the growing importance of professional operation – and consequently often to the outsourcing of facility management.

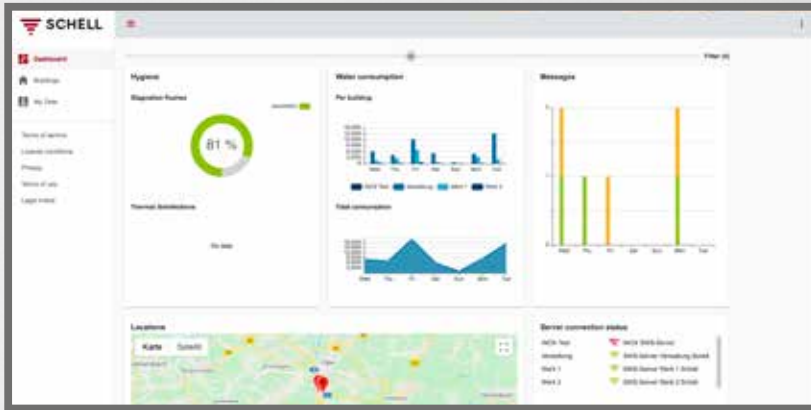
Employees of external facility management companies, but also employees in public administration with corresponding tasks, are often responsible for several properties.



**Central monitoring for  
management efficiency**

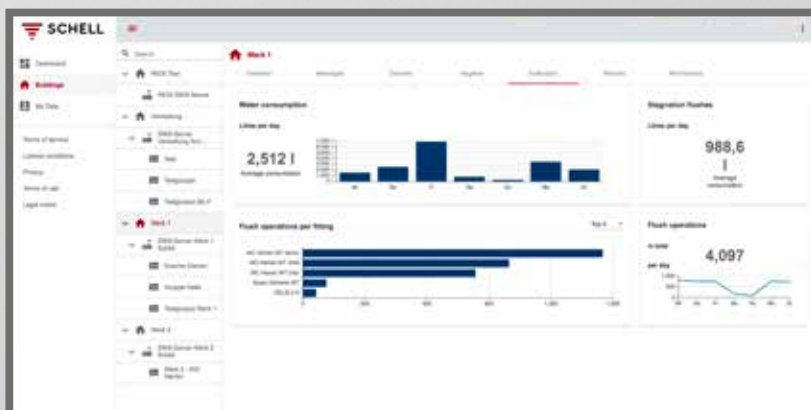
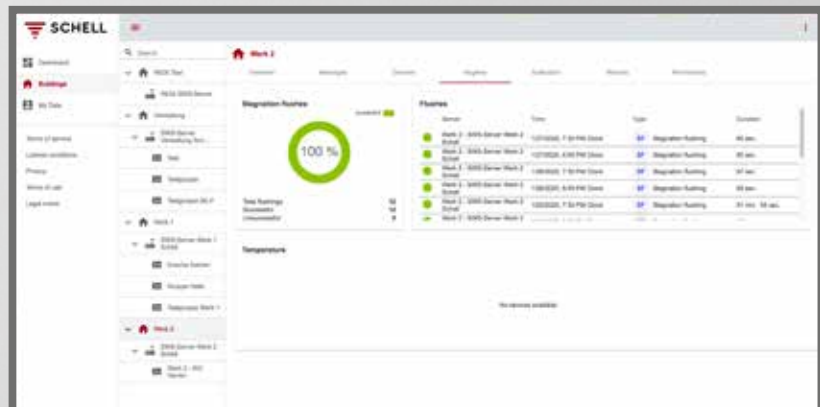
Central, location-independent monitoring and control of the technical processes is an important factor here. Digitalisation creates the required conditions. Modern building technology with networked devices is based on this. The SCHELL water management system SWS can be integrated into the building automation system via a SWS gateway (see pages 24-27).

## Simple, user-friendly management. Even without a central building control system.



The online SMART.SWS service enables quick, location-independent management. When out and about, facility managers can easily use their laptop, tablet or phone to check on their buildings, perform remote maintenance or, if required, alert local facility management staff about an issue. All that's needed is an internet connection. SMART.SWS makes water management easier than ever before.

Hygiene operations are shown individually with their start time, duration and temperature curve (if sensors are used).



The top five least-used fittings are also routinely reported on, so that operating companies and managers can quickly take appropriate action in cases where this lack of use could impact drinking water hygiene.

**Increase in value of the property**  
Permanently safe drinking water installation even with later conversion by simple adjustment of the parameters

**Efficient facility management**  
Lower labour costs thanks to central monitoring and quick fault diagnosis

**Economical use of resources**  
Low water consumption due to optimised flushing and synergy effects when integrated into the BAS



**Operating costs**  
Costs for the SCHELL water management system SWS plus costs for water consumption by ensuring proper operation



## Stagnation flushes. Harmonising hygiene and water savings.

---

Saving water and regular stagnation flushes are fundamentally at odds with each other. The question to ask: How much is the assurance of drinking water quality worth to us? With the SCHELL water management system SWS, the price is lower than perhaps expected.

A permanently hygienic drinking water installation that protects the health of the users is certainly priceless. It is not for nothing that the legislator imposes strict conditions, non-compliance with which can have serious consequences. Stagnation flushes are therefore a must, and the associated water consumption a necessity.

But the SCHELL water management system SWS also offers real estate operators and owners concrete economic advantages throughout the entire life cycle of the building.

The investment in the SCHELL water management system SWS pays for itself in just a few years.



**Priceless**

Sure protection of users' health and reliable compliance with legal requirements

### **During planning, installation and commissioning:**

- lower costs for the drinking water installation, as an inexpensive T-piece installation becomes possible
- efficient, because centralized, parametrisation of all networked fittings
- avoidance of stagnation during the construction phase through centrally controlled flushes

### **During use:**

- efficient facility management through automated processes and central monitoring/control
- energy-saving synergy effects when integrated into the building automation system

### **For inventory protection and change of use:**

- oversized and hygienically critical installations can be rescued
- easy adaptation of the drinking water installation to changed uses possible



## Simple commissioning. Benefiting in selection, planning and installation.

---

Networked fittings are the logical further development of electronic fittings. What sounds simple is simple. The selection of components is uncomplicated. Installation and operation are intuitive and the system is highly flexible. So you can meet the demands of your customers with little effort and protect yourself against hygiene risks.

Our electronic fittings already offer a high degree of hygiene as individual fittings and help to save water. Digitalisation now opens up new possibilities. With only a few components, electronic fittings become networked fittings. The selection of the required components is accordingly clear and uncomplicated. A clear menu navigation makes commissioning and long-term operation unproblematic. The software can be operated almost intuitively.

Parametrisation, control and monitoring of the individual fittings is made safer and more convenient than ever before by the SCHELL water management system SWS.

The SCHELL water management system SWS offers maximum flexibility in the further life cycle of the property. It can be easily extended, adapted or retrofitted. This means that planning and modernization can be carried out flexibly, and the optimum system can always be offered.



### Advantages in selection, planning and installation

**Secure your competitive advantage as an installer with the SCHELL water management system SWS – and offer your customers a safe and future-oriented drinking water installation with little effort.**

- easy configuration due to few components and flexible network typologies
- intuitive operation of the browser-based software
- flexibility in the life cycle through simple adaptations
- easily expandable thanks to modular system



### Benefits of SMART.SWS

And you don't need to worry about SMART.SWS commissioning: all of this work is always completed by a SCHELL service technician. Saving you time and effort.

## References.

### Big or small, SCHELL SWS masters them all.

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Sampling in the obsolete drinking water installation revealed borderline findings. Thanks to the SCHELL water management system SWS it could be modernised without having to replace the pipes.

#### Charité, Benjamin Franklin Campus, Berlin

**The challenge:** Renovation of the operating theatres on the Benjamin Franklin Campus with stringent requirements for drinking water quality and its documentation

**The result with SWS:** Contact-free electronic fittings, networked temperature sensors and centrally controlled hygiene flushes now ensure the reliable maintenance of drinking water quality at the hospital. Despite considerable variation in water requirements, water stagnation is reliably prevented, with stagnation flushes being performed both at scheduled times and when critical temperatures are reached across all of the points of use. Water usage, stagnation flushes and water temperatures are recorded continuously, and can be analysed easily to ensure seamless documentation of operation in compliance with relevant legislation. Straightforward control, maintenance and diagnostics for all networked fittings ensures cost-effective facility management.



VITUS VW-E-T wash basin tap with contact-free IR operation







### Vacuumschmelze, Hanau

**The challenge:** Achieving an optimum balance between the need to save water and energy, user comfort and drinking water hygiene while converting sanitary facilities.

**The result with SWS:** Instead of the legacy fittings, new electronic self-closing fittings ensure the user-friendly operation of showers, wash-basins and urinals. Regular stagnation flushes ensure drinking water quality is maintained – especially during annual holidays. Since usage, flushes and thermal disinfections are logged continuously, these can be analysed and adjusted to achieve significant savings in consumption and operating costs.



XERIS ET wash basin tap with integrated thermostat

### 3-Field Sports Centre, Berlin (Neukölln)

**The challenge:** oversized pipework cross-sections and a lack of concurrency in usage present risks to drinking water hygiene

**The result with SWS:** Battery-operated electronic fittings, which operate wirelessly, have been installed in building sections. Stagnation flushes have been programmed as groups of fittings to ensure that the water in the system is replaced regularly in full, as is required. This ensures continuous protection of drinking water quality without requiring a cost-intensive pipework renovation project that would also mean a prolonged interruption to the Centre's sporting and league activities.



VITUS VD-C-T shower fitting with integrated thermostat

## Networking options. An overview.







SWS is the first water management system to be able to control all fitting series in the public sanitary room wireless and cable-based simultaneously as well as with battery operation – for the best possible hygiene, high water saving efficiency and excellent facility management.






The adjacent table shows which fittings from the SCHELL product portfolio can already be networked using the SWS system. Good to know: Additions, changes and retrofits to the SCHELL water management system SWS are quickly and easily possible at any time.


## Do you have questions about SWS or SMART.SWS?

Have questions about our innovative hygiene solution? Please get in touch. We are happy to support you in all technical questions concerning planning, design and component selection for your application. Even after installation, we will be glad to answer all your questions about the smooth operation of SWS or SMART.SWS.

system components		base components		
				
fitting product ranges		SMART.SWS	SWS water management server	SWS bus mains adapter

WASH BASIN TAPS				
	XERIS E-T	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	PURIS E	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	VENUS E	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	CELIS E	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	VITUS VW-C-T	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	VITUS VW-E-T	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	LINUS W-E-M	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SHOWER FITTINGS				
	LINUS D-C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	LINUS Basic D-C-T	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	LINUS Paneel DP-C-T	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	VITUS VD-C-T o	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	VITUS VD-C-T u	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

WC FLUSH VALVES				
	EDITION E MANUAL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

URINAL FLUSH VALVES				
	EDITION E	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

wireless network compatible		optional accessories	optional accessories					
								
SWS wireless manager FM	SWS wireless bus extender BE-F	SWS wired bus extender BE-K	solenoid valve TD	temperature contact sensor PT 1000	COMFORT PT angle valve	LINUS outlet temperature sensor	LINUS inlet temperature sensor	SWS leak protection valve

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◆ VITUS wireless bus extender integrated in the fitting

◆◆ VITUS wireless bus extender and TD solenoid valve integrated in the fitting

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